Chapter 3

FIGHTER DEMONSTRATION ROUTINE

301. PREFACE

This Manual is intended to be the primary reference for the FDP and to assist with the handover of duties from year to year. The FDT represents the professionalism, skill and teamwork inspiring Canadians to consider a career in the Canadian Forces. This routine is designed to showcase the aircraft's capabilities as well as the exceptional flying skills of our fighter pilots. The maneouvres shall be flown in accordance with the minimum and maximum limitations outlined in this standardized package. If at any time, these limitations have been exceeded, pilots will recover the aircraft by the most effective means possible. The routine may continue if an accurate airborne assessment can be carried out and only when the aircraft is safely re-established at the entry parameters of the manoeuvre. The primary responsibility and considerations of the pilot during an Air Display will be prioritized towards spectator safety, followed by the safety to crew and then equipment. Mission first, safety always!

302. REPOSITIONS

The following repositions can be flown at any time by the FDP based on weather, terrain and built area around the sterile air display area.

1. 90° / 270° REPOSITION

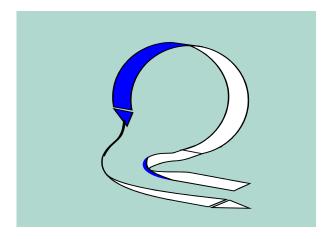
The aircraft will perform a 90° turn away from the showline and pull up into a loop. The apex of the loop will be a minimum of 4000 feet AGL and have a maximum of 250 KCAS. The aircraft will be $\frac{1}{4}$ rolled at 90° nose down in order to align the aircraft with the showline. The roll shall be completed by a minimum of 3000 feet AGL and dive recovery initiated at 300 KCAS or 2500 feet AGL, whichever occurs first.

Entry parameters:

i. Altitude: 300 feet AGL;

ii. Airspeed: 325 KCAS; and

iii. Showline: Reposition for the 1500 foot showline



2. SPLIT "S" REPOSITION

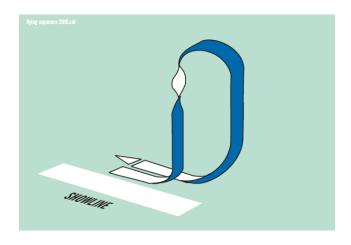
The aircraft will turn 10 $^{\circ}$ away from the showline and commence a vertical climb with a minimum entry speed of 325 KCAS followed by a 180 $^{\circ}$ roll in the vertical. The minimum apex altitude of the reversal will be 3500 feet AGL with a maximum speed of 250 KCAS. Recovery will be initiated no later than 2500 feet AGL or 300 KCAS, whichever occurs first. Recovery shall be no lower than 300 feet AGL.

Entry parameters:

i. Altitude: 3500 feet AGL;

ii. Airspeed: 120-250 KCAS (for pull down); and

iii. Showline: 1500 feet.



3. SQUARE LOOP REPOSITION

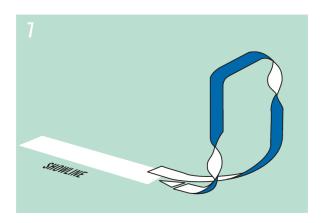
Turning 45° away from the show line, the aircraft will begin a pull up with a min entry speed of 325 KCAS. Through the vertical, the aircraft will be rolled so that it is perpendicular to the show line. At 3500 feet AGL, the aircraft will be pulled to inverted and flow back toward the show line with a minimum apex of

4000 feet AGL. Inverted flight will be maintained for no more than 10 seconds with an airspeed of 135-200 KCAS. Once the aircraft is lined up with the show line, a 25° AOA pull will be made to position the aircraft 90° nose down. The aircraft will be ½ rolled to parallel the show line by 3000 feet AGL. At a minimum altitude of 2500 feet AGL or 300 KCAS (whichever occurs first) a 25° AOA pull will be maintained to bring the aircraft back to level flight no lower than 300 feet AGL.

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 325 KCAS; and

iii. Showline: Reposition for the 1500 foot showline.



4. LIVE SIDE 270° REVERSAL

The aircraft will be reversed through 270° on the live side for the next pass.

Entry parameters:

i. Altitude: 500 feet AGL;

ii. Airspeed: 230-250 KCAS; and

iii. Showline: Reposition for the 1500 foot showline.

5. 40-220 ° LIVE SIDE REPOSITION

The aircraft will climb, turn away 40° and reverse back 220° with a 270° tuck under roll (when altitude permits) towards the 1500 foot showline for the next pass.

6. 40-220° COLD SIDE REPOSITION

The aircraft will climb, turn away 40° towards the hot side and reverse back 220° with a 290° tuck under roll (when altitude permits) towards the 500 foot show line for the next pass; and

7. RUDDER ROLL OBLIQUE REPOSITION

The aircraft will be turned 40° away from the crowd. The nose of the aircraft will then be pulled up to minimum 45° nose up and increase the alpha to 25° AOA. A 360° Rudder Roll will be commenced away from the show line. The aircraft will maintain a minimum airspeed of 180 KCAS. The aircraft will continue to fly away from the crowd on the live side and then be reversed 220° to line up with the 1500 foot showline.

8. REVERSE HALF CUBAN REPOSITION

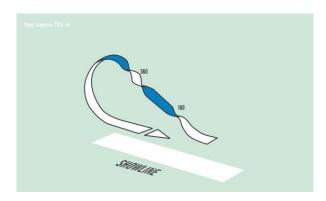
The aircraft will be pulled to 45-60° nose up and rolled through 180° to the inverted. At 2500 feet AGL the, the aircraft will be rolled 360°. With a minimum apex of 3500 feet AGL and a maximum airspeed of 250 KCAS, a 25 AOA pull with full afterburner will be executed in order to achieve a level flight recovery by 300 feet AGL.

Entry parameters:

i. Altitude: 3500 feet AGL;

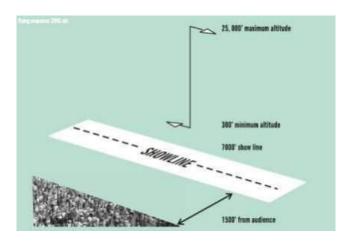
ii. Airspeed: 120 - 250 KCAS; and

iii. Showline: Reposition for the 500 foot showline.



303. HIGH SHOW PROFILE

In accordance with B-GA-100-001 regulations, the CF-18 High Show will be flown when the minimum ceiling is 5000 feet AGL with a visibility of three statute miles or greater. Each manoeuvre that can be flown during the high show is described in detail below. There are 2 options for the take-off manoeuvre during the high show profile. The FDP will select the manoeuvre that he/she wishes to perform for the season.



1. TAKE-OFF DIRTY ROLL AND CUBAN 8

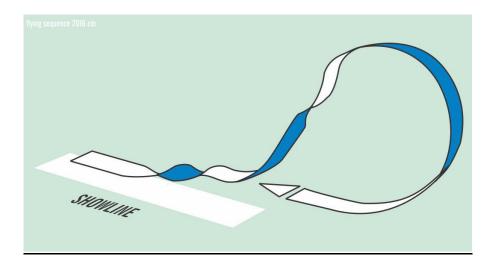
The show will begin with a maximum performance take-off with flaps set to AUTO and trim set to 4° nose up. The take-off will occur at 170 KCAS with the nose of the aircraft being pulled up to 25-30° followed by a 360° roll. Upon completion of the roll, the aircraft will be at ~210 KCAS and commence a 10°-15° AOA climb. The landing gear will be selected up once the aircraft is in a stabilized climb at less than 2G.

Show sites where the runway is inside of the 1500 foot showline will require the aircraft to be turned away from the spectator area and cross the 1500 foot showline before conducting the Dirty Roll. Off field show sites shall begin with a pass from behind and overhead the crowd at 500 feet and up to 0.95 Mach followed by a climbing 270° arc in order to reposition for the Cuban 8 along the 1500 foot showline at 300 feet AGL and 325 KCAS.

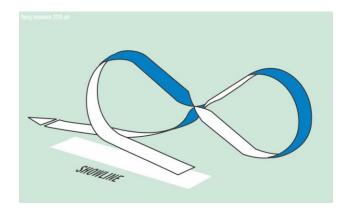
Entry parameters:

i. Altitude: 200 feet AGL, AOB not to exceed 75° below 300 feet AGL;

ii. Airspeed: 170 KCAS; and iii. Showline: 1500 feet.



The minimum apex altitude for the first half of the Cuban will be 3500 feet AGL, with an airspeed of 120 KCAS or greater (maximum speed of 250 KCAS). The aircraft will hold a 45° inverted dive before initiating a roll upright by 2500 feet AGL in order to commence a wings level dive recovery no later than 1500 feet AGL. The minimum altitude during the recovery shall be no lower than 300 feet AGL. The second half of the Cuban will be flown identical to the first. Recovery and pull up will commence no lower than 1500 feet AGL with a maximum speed of 350 KCAS.

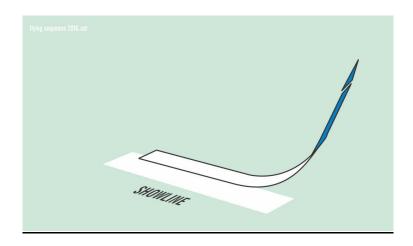


2. MAXIMUM PERFORMANCE CLIMB AND CUBAN 8

The show will begin with a normal take-off with flaps set to HALF, trim set to 12° nose up and RADALT selected as the altitude source. Landing gear and flaps will be cycled up as soon as possible, once positive climb is confirmed. The aircraft will be held at 50ft AGL until an airspeed of 290 – 310kts is achieved at which point a maximum performance pull to 60° nose up is executed. Once stabilized in the climb, BAROALT will be selected in the HUD. If flightpath will be extended beyond the airport environment or if obstacles are present, a climb to 200ft AGL will be commenced.

Entry parameters:

i. Altitude: 50ft AGLii. Airspeed: 290-310ktsiii. Showline: 500ft



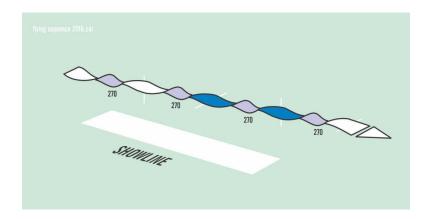
The minimum apex altitude for the first half of the Cuban will be 3500 feet AGL, with an airspeed of 120 KCAS or greater (maximum speed of 250 KCAS). The aircraft will hold a 45° inverted dive before initiating a roll upright by 2500 feet AGL in order to commence a wings level dive recovery no later than 1500 feet AGL. The minimum altitude during the recovery shall be no lower than 300 feet AGL. The second half of the Cuban will be flown identical to the first. Recovery and pull up will commence no lower than 1500 feet AGL with a maximum speed of 350 KCAS.

3. QUAD 270^O ROLL

At 3000 feet prior to show center, with a minimum speed of 375 KCAS, the aircraft's nose will be raised to 15° nose up, and will commence four (4) consecutive 270° rolls.. The aircraft will momentarily pause after each 270° roll. After the last 270° roll, the nose of the aircraft shall be no lower than 10° nose down. The aircraft will then be recovered to level flight. If the nose drops to 10° nose down prior to the last 270° roll, the aircraft shall be recovered.

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 375 KCAS; andiii. Showline: 1500 feet.

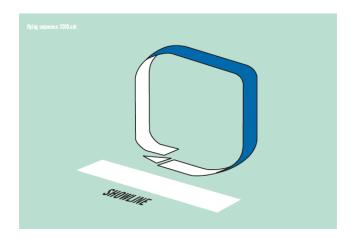


3. SQUARE LOOP AND RUDDER ROLL

At 325 KCAS, with both afterburners lit, a maximum G pull to the vertical will be executed. The aircraft will unload for a vertical extension to 2500 feet AGL. The aircraft will then be pulled at 25° AOA in order to establish inverted flight (maximum of 10 seconds) at a minimum altitude of 3500 feet AGL. With an airspeed of 135-200 KCAS, a 25-30° AOA pull will position the aircraft 90° nose down along the 1500 foot showline. At a minimum altitude of 2500 feet AGL or 300 KCAS (whichever occurs first) a 25° AOA pull will be maintained to bring the aircraft back to level flight no lower than 300 feet AGL;

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 325 KCAS; andiii. Showline: 1500 feet.



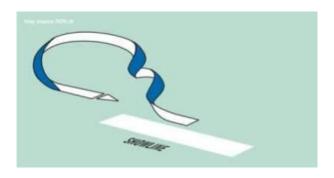
Upon completion of the Square Loop, the aircraft will be turned 40° away from the crowd. The nose will then be pulled to 45° nose up and increase the alpha to 25° AOA. A 360° Rudder Roll will be commenced away from the showline while maintaining a minimum airspeed of 180 KCAS. The aircraft will

continue to fly away from the crowd on the live side and then be reversed 220° to line up with the 1500 foot showline.

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 300 KCAS; and

iii. Showline: Reposition for the 1500 foot showline.



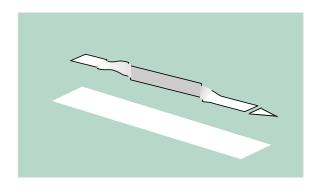
5. TOP SIDE PASS

The Top Side Pass will be flown along the 1500 foot showline at 400 KCAS and 300 feet AGL. At 3000 feet prior to the show center, the aircraft will be pulled to 5° nose up and rolled 100° angle of bank. Power, top side rudder and forward stick will be applied to maintain the manoeuvre. As the aircraft's nose reaches the horizon, the aircraft will be recovered to level flight, no lower than 300 feet AGL.

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 400 KCAS; and

iii. Showline: 1500 feet.

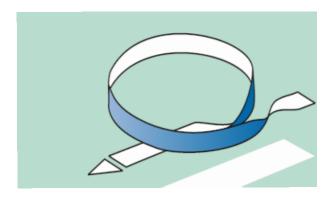


6. LEVEL HIGH G 360° TURN HIGH ALPHA LOOP AND RUDDER ROLL

The aircraft will fly along the 1500 foot showline in order to set up for the Level High G 360° Turn. At 325 KCAS and 300 feet AGL (maximum altitude of 400 feet AGL), the nose of the aircraft will be raised 2° nose up prior to a 290° tuck under roll. With afterburner selected, the aircraft will perform a maximum rate 360° turn until parallel with the 1500 foot showline. A 70° roll to level flight will be executed to recover the aircraft back to level flight.

Entry parameters:

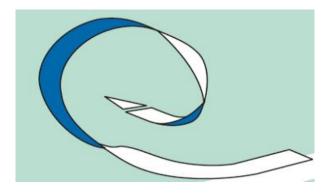
i. Altitude: 300 feet AGL;ii. Airspeed: 325 KCAS; andiii. Showline: 1500 feet.



Upon completion of the Level High G 360° Turn, the aircraft will commence a High Alpha Loop with a minimum airspeed of 325 KCAS in full afterburner. A maximum G pull up to the vertical will be executed and the aircraft will unload for a vertical extension to 1500 feet AGL. The aircraft will then be pulled to maintain 25°-30° AOA and pass through inverted flight at a minimum of 3500 feet AGL. With 90° of the loop remaining, a rudder turn will be completed to place the aircraft flying away from the crowd. The aircraft will recover from the High Alpha Loop by 1,000 feet AGL. Upon completion of the High Alpha Loop, the nose will then be pulled up to minimum 45° nose up and increase the alpha to 25° AOA. A 360° Rudder Roll will be commenced away from the show line. The aircraft will maintain a minimum airspeed of 180 KCAS or greater.

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 325 KCAS; andiii. Showline: 1500 feet.



7. DIRTY INVERTED PASS

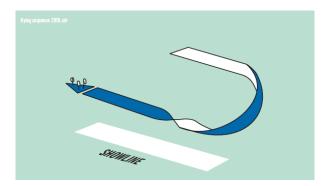
The aircraft will reposition from the live side to line up with the 1500 foot showline. At less than 300 KCAS, the arresting hook and refuelling probe will be extended. At 240 KCAS and less than 2G, the landing gear will be extended. 3000 feet prior to show center and 500 feet AGL, the aircraft nose will be raised to 5°-7° and rolled 180° to the inverted position for a maximum of 10 seconds followed by a 180° roll, returning the aircraft to the upright position. The landing gear, hook and probe will then be retracted from a stabilized aircraft at less than 250 KCAS and 2G.

Entry parameters:

i. Altitude: 500 feet AGL;

ii. Airspeed: 230-250 KCAS; and,

iii. Showline: 1500 feet



After extending out from the Dirty Inverted Pass, the aircraft will retract the landing gear, arresting hook and refuelling probe while turning to the cold side for the next manoeuvre.

8. <u>HIGH ALPHA PASS</u>

The aircraft will approach from the cold side at no lower than 500 feet AGL and 25 AOA. Approaching the show line, the aircraft will be turned to line up and

parallel the 1000 foot showline. Just beyond show centre, the standard recovery procedure will be flown.

a) Entry parameters:

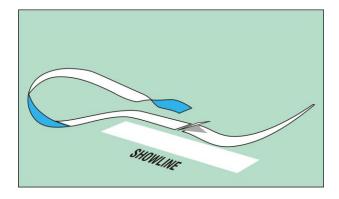
i. Altitude: 500 feet AGL;

ii. Airspeed: 180-220 KCAS; and

iii. Showline: 1000 feet.

b) Given the fact that standard aircraft cautions and warnings will not provide adequate indication of a loss of thrust in a timely manner, a recovery will immediately be initiated if any of the following occur:

- AOA reaches 27° without indications of positive correction (minor transients up to 27° is allowed provided immediate corrections are applied and aircraft responds);
- ii. Altitude reaches 450 feet AGL with corrections applied and aircraft not responding;
- iii. Un-commanded heading change of -/+15°; and
- iv. Landing Gear Warning tone remains on after positive corrections have been applied.
- c) Standard recovery procedures:
 - Simultaneously select MIL power on both engines, opposite rudder to keep sideslip at zero, and aggressively lower the nose to seek a maximum of 15 AOA;
 - ii. Select maximum AB, if desired, once the AOA is less than or equal to 15° AOA; and
 - iii. For both MIL and MAX power recoveries, climb with a maximum AOA of 15°.



Upon completion of the high alpha pass, at a minimum airspeed of 250 KCAS and a minimum altitude of 500 feet AGL, the aircraft will be rolled 270° to tuck back to the cold side and set-up for the next pass.

9. VERTICAL ROLLS AND SPIRAL DESCENT

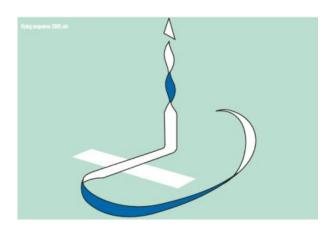
The aircraft will be accelerated up to a maximum of 0.95 Mach and achieve wings level at 500 feet AGL prior to passing overhead the crowd. 1000 feet prior to show centre, a gradual 6G pull to the vertical will be executed followed by a four-point hesitation roll or multiple 360 ° rolls in opposite directions with momentary pauses after each roll. Depending on the weather, the climb will be conducted up to a maximum of 25,000 feet MSL. A modified 45-60° nose up pull at 400 KCAS will be conducted in order to accommodate ceilings lower than 15 000 feet MSL.

Entry parameters:

i. Altitude: 500 feet AGL;

ii. Airspeed: 400 KCAS - 0.95 Mach; and

iii. Showline: 500 feet.



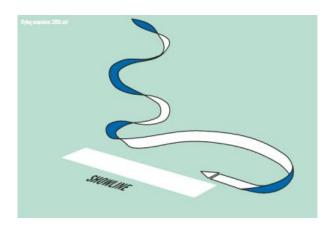
The aircraft will be recovered via an idle descending turn at 20-25° AOA on the live side. A blend of rudder and back stick will be required for this manoeuvre. Rudder inputs must be managed to ensure no yaw greater than 360° is performed. The aircraft recovery from the Spiral Reposition will be initiated at 5000 feet AGL in order to set up for the High-Speed Pass.

Entry parameters:

i. Altitude: Recovery initiated by min 5000 feet AGL;

ii. Airspeed: 200 KCAS or greater; and

iii. Showline: Reposition for the 500 foot showline.



10. <u>HIGH-SPEED PASS</u>

The High Speed Pass will be conducted at 300 feet AGL, up to 0.95 Mach along the 500 foot show line.

Entry parameters:

i. Altitude: 300 feet AGL;

ii. Airspeed: Up to 0.95 Mach; and

iii. Showline: 500 feet.

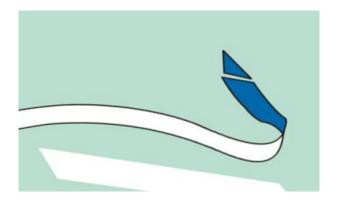
11. CANOPY PASS AND HALF BARREL ROLL

The Canopy Pass will be positioned on the 500 foot showline at 300 feet AGL and 325 KCAS. Passing show centre, the aircraft will be pulled up into a Half Barrel Roll and flown away from the crowd inverted with the nose of the aircraft on or above the horizon. Prior to a maximum of 10 seconds of inverted flight, the aircraft will be rolled 180° upright. If sufficient fuel allows, the CF-18 will reposition for the Heritage Flypast or the Attack and Pyrotechnic Display. If there is insufficient fuel, or if one of these profiles is not scheduled at the event, the aircraft shall be repositioned to land or engage the Mobile Aircraft Arresting System (MAAS) when available.

Entry parameters:

i. Altitude: 300 feet AGL;ii. Airspeed: 325 KCAS; and

iii. Showline: 500 feet.



304. LIMITED / FLAT SHOW PROFILE

In accordance with B-GA-100-001 regulations, the CF18 Limited Show will be flown when weather conditions are below those required for the High Show, but not less than a minimum ceiling of 2500 feet AGL and three statute miles visibility. The CF18 Flat Show will be flown when weather conditions are below those required for the Limited Show, but not less than a minimum ceiling of 1500 feet AGL and three statute miles visibility.

NOTE

With the exception of the Inverted Pass, all aerobatic entry parameters are outlined under the High Show Profile.

1. TAKE-OFF DIRTY ROLL

The show will begin with a maximum performance take-off with flaps set to AUTO and trim set to 4° nose up. The take-off will occur at 170 KCAS with the nose of the aircraft being pulled up to 25-30° followed by a 360° roll. Upon completion of the roll, the aircraft will be at ~210 KCAS and commence a 10°-15° AOA climb. The landing gear will be selected up once the aircraft is in a stabilized climb at less than 2G;

Show sites where the runway is inside of the 1500 foot showline will require that the CF-18 be turned away from the spectator area and cross the 1500 foot showline before conducting the Dirty Roll. Off field show sites shall begin with a pass from the cold side (behind and overhead the crowd) at 500 feet and up to 0.95 Mach followed by a climbing 270° arc in order to reposition for the Inverted Pass.

2. INVERTED PASS

From 300 feet AGL and 400 KCAS the aircraft will be pulled to 5° nose up, rolled to the inverted position and flown along the 1500 foot showline. The aircraft will be rolled upright prior to attaining a maximum inverted flight time of 10 seconds. Recovery will be initiated if the aircraft nose falls through the horizon.

Entry parameters:

i. Altitude: Min 300 feet AGL;ii. Airspeed: 400 KCAS; and

iii. Showline: 1500 feet.

3. QUAD 270° ROLL

At 3000 feet prior to show center, with a minimum speed of 375 KCAS, the aircraft's nose will be raised to 15° nose up, and will commence four (4) consecutive 270° rolls.. The aircraft will momentarily pause after each 270° roll. After the last 270° roll, the nose of the aircraft shall be no lower than 10° nose down. The aircraft will then be recovered to level flight.

4. TOP SIDE PASS

The Top Side Pass will be flown along the 1500 foot showline at 400 KCAS and 300 feet AGL. 3000 feet prior to the show center the aircraft will be pulled to 5° nose up and rolled 100° angle of bank. Power, top side rudder and forward stick will be applied to maintain the manoeuvre. As the aircraft's nose reaches the horizon, the aircraft will be recovered to level flight, no lower than 300 feet AGL.

5. <u>LEVEL HIGH G 360° TURN</u>

The aircraft will fly along the 1500 foot showline in order to set up for the Level High G 360° Turn. At 325 KCAS and 300 feet AGL (maximum altitude of 400 feet AGL), the aircraft's nose will be raised 2° nose up prior to a 290° tuck under roll. With afterburner selected, the aircraft will perform a maximum rate 360° turn until parallel with the 1500 foot showline. A 70° roll to level flight will be executed to recover the aircraft back to level flight.

6. DIRTY INVERTED PASS

At less than 300 KCAS, the arresting hook and refuelling probe will be extended. At 240 KCAS and less than 2G, the landing gear will be extended. 3000 feet prior to show center and 500 feet AGL, the aircraft nose will be raised to 5°-7° and rolled 180° to the inverted position for a maximum of 10 seconds followed by a 180° roll, returning the aircraft to the upright position. The landing gear, hook and probe will then be retracted from a stabilized aircraft at less than 250 KCAS and 2G.

After extending out from the Dirty Inverted Pass, the aircraft will retract the landing gear, arresting hook and refuelling probe while turning to the cold side for the next manoeuvre.

7. HIGH ALPHA PASS

The aircraft will approach from the cold side at no lower than 500 feet AGL and 25 AOA. Approaching the showline, the aircraft will be turned to line up and parallel the 1000 foot showline. Just beyond show centre, the standard recovery procedure will be flown. At a minimum airspeed of 250 KCAS and minimum of 300 feet AGL, the aircraft will be rolled 270° to tuck back to the cold side and set-up for the next pass.

8. OVERHEAD PASS

The aircraft will be accelerated up to a maximum of 0.95 Mach and achieve wings level at 500 feet AGL prior to passing overhead the crowd. After passing over the crowd, set up either left or right for the next pass.

9. HIGH-SPEED PASS

The High Speed Pass will be conducted at 300 feet AGL, 0.95 Mach along the 500 foot show line;

10. CANOPY PASS AND HALF BARREL ROLL

The Canopy Pass will be positioned on the 500 foot showline at 300 feet AGL and 325 KCAS. Passing show centre, the aircraft will be pulled up into a Half Barrel Roll and flown away from the crowd inverted with the nose of the aircraft on or above the horizon. Prior to a maximum of 10 seconds of inverted flight, the aircraft will be rolled 180° upright. If sufficient fuel allows, the CF-18 will reposition for the Heritage Flypast or the Attack and Pyrotechnic Display. If there is insufficient fuel, or if one of these profiles is not scheduled at the event, the aircraft shall be repositioned to land or engage the Mobile Aircraft Arresting System (MAAS) when available.

11. DIRTY PASS

The Dirty Pass is a backup manoeuvre that can be substituted for any other manoeuvre, in the high or limited/flat show profile, if required for unpredicted circumstances. At less than 300 KCAS, the arresting hook and refuelling probe will be extended. At 240 KCAS and less than 2G, the landing gear will be extended. The Dirty Pass is flown on the 500 foot showline. After passing the end of the primary spectator area, the landing gear, hook and probe will be retracted at less than 250 KCAS:

Entry parameters:

i. Altitude: 300 feet AGL;

ii. Airspeed: 230-250 KCAS; and

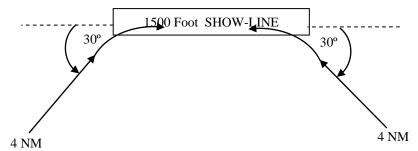
iii. Showline: 500 feet.

305. ATTACK AND PYROTECHNIC DISPLAY

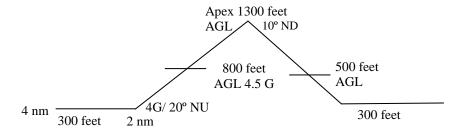
The Attack and Pyro Show will be flown when the minimum weather is 1500 feet AGL and visibility of three statute miles or greater. A face-to-face brief between the pilot and the pyrotechnics team will be conducted at least one day prior and the day of the show. There will be two types of maneouvres; Strafe/Bomb and a Wall-Of-Fire Pass:

1. STRAFE/BOMB PASS

This will commence at a distance of 4 nm from show centre at a heading 30° off of the showline from either the live side or the cold side. Bomb attacks will recover to straight and level flight and strafe attacks will recover to a 30° nose up attitude. The ingress will be flown at 300 feet AGL (if not over built up areas) at a maximum speed of 400 KCAS.



At a distance of 2 nm from the show centre the pilot will commence a 4 G pull to 20° nose up. At 800 feet AGL the pilot will commence a 135° roll towards show centre and commence a 4.5-5 G pull to 10° nose down attitude, parallel to the showline. The CF-18 shall apex at an altitude of 1300 feet AGL and line up on the 1500 foot showline. The pilot will start a wings level, 5 G recovery at 500 feet AGL to recover no lower than 300 feet AGL. The pyrotechnics team will commence the "Strafe" pass after the aircraft nose is 10° down. The "Bomb" pass will commence just as the aircraft is starting the 5G recovery; and



2. WALL-OF-FIRE PASS

The pilot will line up on the 1500 foot showline, wings level at an altitude of 500 feet AGL and up to Mach 0.95. As the aircraft flies over show centre the pyrotechnics team will commence the Wall-of-Fire.